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- Britain during and after the war.* Reprint from report of Bureau of Industrial Housing and Transportation. (Washington: U. S. Housing Corporation, U. S. Dept. Labor. 1919. Pp. 19.)
- Schools and factories.* Sanitary series, Framingham monograph no. 6. (Framingham, Mass.: Community Health Station. 1919. Pp. 62.)
- The welfare of the children of women employed in factories in France and Germany.* (London: Intelligence Department. 1919. Pp. 58. 6d.)
- The welfare work of the Metropolitan Life Insurance Company for its employees. Reports for 1918.* (New York: The Company. 1919.)
- Arbeidersbudgets gedurende de Crisis (Tweede bundel).* Uitgegeven voor rekening van het Department van Arbeid. (Leyden: Department van Arbeid. 1919. Pp. 125.)

Insurance and Pensions

- Sources and Characteristics of the Principal Mortality Tables.* By HENRY MOIR and others. Actuarial Studies, No. 1. (New York: The Actuarial Society of America. 1919. Pp. iv, 79.)
- Graduation of Mortality and Other Tables.* By ROBERT HENDERSON and H. N. SHEPPARD. Actuarial Studies, No. 4. (New York: The Actuarial Society of America. 1919. Pp. v, 82.)

The Actuarial Society of America is publishing a set of small volumes to assist students of actuarial science and to furnish means of ready reference for actuaries. The two books under review are the first of this set to appear. The mortality table as the basis of all life insurance contracts is first emphasized in book No. 1. Then after commenting on the presumption of the existence of mortality tables among the Romans, the history of existing tables is taken up in an interesting manner beginning with the work of Halley in 1693 in the construction of Halley's Table from the registers of death in the city of Breslau. The most important facts as to the sources of more than thirty different sets of data from which mortality tables have been formed are given and pertinent comments are made on the characteristics of the resulting tables.

For a small book, it contains a wealth of reliable information that will be found useful to any serious student of insurance. However, it would be a mistake to infer from the title and treatment that the book deals with all or nearly all the important mortality tables that are or have been used in the world. Indeed, the treatment is confined almost entirely to British, American, and

Canadian tables. Exceptions to this are found in the mention of early French tables, Gotha Life Office Tables, Japanese Life Tables, Danish Survivorship Tables, and references to mortality investigations in tropical regions. No mention seems to be made of a number of carefully prepared French and German tables covering large experiences, or of tables of other countries of continental Europe.

As the book is intended to supply a means of ready reference for actuaries, it is fair to say that for this purpose it could be improved by the addition of an index. We may, however, overlook this slight defect in the light of the large service that has been rendered in preparing so handy a little volume, with suitable references for a more thorough study of the subject.

No. 4 of the series of Actuarial Studies begins with an explanation of the reason for the graduation of serial statistics. The fact is recognized that both with frequency distributions and with tables of ratios arranged in seriate order, it is a natural assumption that if the number of cases involved were indefinitely increased, the resulting values would exhibit marked regularity. It is aptly pointed out that the purpose of graduation is to make as near an approach as possible to a table showing the results of an unlimited experience.

The criteria of a good graduation are next considered. Smoothness of results and closeness to the observed facts are the criteria to be applied. With respect to smoothness, it is stated that if the series is determined by a mathematical formula, this is usually taken as a sufficient test; but, when not so determined, the criterion usually adopted is smallness of third differences of the graduated series. It should perhaps be pointed out that specification of the smallness of third differences is a very different condition from the representation by a mathematical function. In fact, the requirement that third differences shall vanish is equivalent to a condition that a polynomial of degree two represent the graduated series. By allowable inference, under assumptions of continuity, the condition that third differences shall be small implies that a second degree polynomial shall approximate the distribution. This is a very special function compared to general frequency formulas. The book calls attention to Pearson's test of goodness of fit but no attempt is made to apply it.

The main part of the book deals with graduation by four dif-

ferent methods: by graphical representation, by interpolated series, by summation formula, and by a mathematical function. The treatment is necessarily so brief that the references to papers listed in the bibliography at the end of the book are very valuable for the student who is to make a thorough study and applications of the theory presented. Corresponding to the four methods of graduation, there are presented four different graduations of the same rough data—the experience of British Offices on female lives insured on the ordinary life participating plan excluding the first fifty years of assurance. Comparisons are made of the four sets of results with respect to smoothness and agreement with the original data. As applied to this sample of data, the conclusion drawn is that the order of the methods with respect to smoothness is: first, the mathematical function given by Makeham's formula; second, graphic method; third, summation; and fourth, interpolation.

It is well recognized that graduation by certain mathematical functions possesses advantages over all others on the score of smoothness. It is well maintained in this book that the choice of methods becomes a question whether the total of deviations from the original distribution irrespective of sign does not materially exceed the expected, and whether any special feature of the distribution is well represented. Indeed, on account of the additional advantages in connection with joint life insurance, it is held that a very liberal interpretation should be given to these two conditions before discarding Makeham's formula when joint life business is involved.

Where a mathematical law cannot be applied, the position is taken that in case of scanty data it will usually be found that the graphic method will produce best results. Where extensive data are available, a more satisfactory set of results is likely to come from the method of interpolation or summation as these do not depend on the personal judgment of the operator except in the selection of the formulas for graduation.

In conclusion, it should be said that this book will be very useful both to students and to trained actuaries because it brings into convenient form the essential ideas of graduation, and gives references to the literature that will facilitate a more careful study of this subject.

It appears that on page 42, line 22, the expression $\frac{l_x \mu_x d_x}{l_o}$ should read $\frac{l_x \mu_x dx}{l_o}$. That is to say, the subscript x on d should not be a subscript, but should be a part of dx .

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Federal Military Pensions in the United States. By WILLIAM H. GLASSON. Edited by DAVID KINLEY. Carnegie Endowment for International Peace, Division of Economics and History. (New York: Oxford University Press. 1918. Pp. xii, 305. \$2.50.)

An impartial survey of the pension system of the United States has long been desired by students of political and economic history. The timely appearance of such a volume as this, just as our government was changing from the antiquated system of paying pensions for military and naval service, to the more modern theory of providing war risk insurance to all men enrolled in the service, adds to the value of this book.

The volume stands alone in the field of pension history. The origin and gradual growth of the American system of pensioning all men who performed military and naval service, the history of the numerous laws governing their application, the impulses—sometimes patriotic but more often political—that lay back of the passage of these laws, and the economic and moral effects resulting from such a system, are treated thoroughly and impartially.

Due to the fact that our federal pension laws make a sharp distinction between military services performed prior to March 4, 1861, and services rendered since that date, the author has wisely divided the book into two parts. In part I, he discusses the English and colonial origins of pensions; the Revolutionary pensions from 1776 to 1789, and from 1789 to 1878; Regular Army and Navy pensions; and the War of 1812, Indian Wars and Mexican War pensions. By far the most valuable chapters are the two dealing with the Revolutionary pensions from 1776-1789 and from 1789-1878. The frequent demands made by the soldiers of the Revolutionary War upon their own commonwealth and upon the members of the Continental Congress for assurances that they would be cared for in case they were wounded, the repeated threats